FIT plans:

1. experimental study of the zigzag non-linear response:
   -> optimize the zigzag design; scans at BNL
2. build the 2nd large GEM prototype and test its properties:
   -> get a spatial resolution of ≤ 100 um
3. proposal for generic R&D:
   -> 3D printing of MPGD prototype for forward tracking

Study of non-linear response

✓ Test properties of different types of zigzag on small 10x10 test boards with the BNL X ray scanner:

→ we expect to see linear response with a zigzag design with 100% interleave (tips go to center of neighbor strips).

(1) have scanned 2 boards [with old design, produced in US companies];

(2) shall test 2 more by June 2016. [with new design and produced in US companies; difficult to get what we have in the design];

(3) will also have 1 or 2 boards with readout on a foil from CERN to test. [with new design, the hope is we get what we have designed].

→ the hope is that (1) we finish this part in three months (by end of July); (2) we have a conclusion on what zigzag parameters to be used for the next full- size prototype.

→ (personal interest) I would like to do some Garfield simulation w.r.t. zigzag-GEM detector.

[this is of common interest as Alexander et al., be willing to help but not do from scratch / this would be great as complimentary R&D achievements.]

The 2nd GEM prototype for EIC FT

Florida Tech

✓ GEM foils:

-> Get common-design GEM foils [by end of May 2016];

-> Validate the foils by measuring leakage current [in June 2016];

✓ Readout foil:

-> finalize the design and get it produced at CERN (CERN is able to produce) [try to get the readout foil by Sep. 2016].

✓ Mechanical work for chamber assembly:

-> finish design and stress analysis [this works as a guidance on what materials to choose, expect to have some conclusions by July-Aug 2016].

-> use local source (3D printer, machine workshop) to produce some mock-up frames for chamber assembly

-> meanwhile search in industry for final materials.

✓ GEM chamber assembled and ready for testing:

-> get chamber ready by Nov 2016

-> the hope is to test it with beam at FNAL in early 2017

-> show performance results to the Committee in summer 2017

Proposal for generic R&D

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3D printing of MPGDs

- Benefit
  - Ease of prototyping and possibly production
  - Cost
- Challenges
  - Simultaneous printing of conductive and insulating materials
  - Printing of microscopic structures
- Plan
  - Start with 10x10 Thick-GEM (3D-THGEM)
- Reference

M. Hohlmann, "Printing out Particle Detectors with 3D-Printers - a Potentially Transformational Advance for HEP Instrumentation," Proc. of 2013 APS-DPF Snowmass Community Summer Study, SNOW13-00137, arXiv:1309.0842, Sep 3, 2013.